Word Problems for Section 3.2

Set up the following linear programing problems. Do not solve.

1. A 4-H member raises only geese and pigs. She wants to raise no more than 16 animals, including no more than 10 geese. She spends \$5 to raise a goose and \$15 to raise a pig, and she has \$180 available for this project. The 4-H member wishes to maximize her profits. Each goose produces \$6 in profit and each pig \$20 in profit. How many of each animal should be raised?

   $x =$ the number of geese raised.
   $y =$ the number of pigs raised.

   Objective function:
   $T = 6x + 20y$ maximized

   Constraints:
   $x + y \leq 16$
   $5x + 15y \leq 180$
   $x \leq 10$
   $x, y \geq 0$

2. The Hi-Fi Record Store is about to place an order for cassette tapes and compact disks. The distributor from which they order requires that each order must request at least 250 items. The prices that Hi-fi must pay are \$3.50 for each cassette and \$7.50 for each compact disk. The distributor also requires that at least 30% of any order be for compact disks. How many cassettes and how many compact disks should Hi-Fi order so that its total ordering costs will be kept to a minimum?

   $x =$ the number of cassette tapes ordered.
   $y =$ the number of compact disks ordered.

   Objective function:
   $C = 3.5x + 7.5y$ minimized

   Constraints:
   $x + y \geq 250$
   $-.3x + .7y \geq 0$
   $x, y \geq 0$

3. The Acrosonic Company manufactures a model G loudspeaker system in plants I and II. The output at plant I is at most 800 systems per month, whereas the output at plant II is at most 600 per month. These loudspeaker systems are shipped to the three warehouses–A, B, and C–whose minimum monthly requirements are 500, 400, and 400, respectively. Shipping costs from plant I to warehouse A, warehouse B, and warehouse C are \$16, \$20, and \$22 per loudspeaker system, respectively, and shipping costs from plant II to each of these warehouses are \$18, \$16, and \$14, respectively. What shipping schedule will enable Acrosonic to meet the warehouses' requirements and at the same time keep its shipping costs to a minimum?

   $x =$ the number of loudspeakers shipped from plant I to warehouse A.
   $y =$ the number of loudspeakers shipped from plant I to warehouse B.
   $z =$ the number of loudspeakers shipped from plant I to warehouse C.
   $u =$ the number of loudspeakers shipped from plant II to warehouse A.
   $v =$ the number of loudspeakers shipped from plant II to warehouse B.
   $w =$ the number of loudspeakers shipped from plant II to warehouse C.

Objective function:
$C = 16x + 20y + 22z + 18u + 16v + 14w$ minimized

Constraints:
$x + y + z \leq 800$
$u + v + w \leq 600$
$x + u \geq 500$
$y + v \geq 400$
$z + w \geq 400$
$x, y, z, u, v, w \geq 0$